Space Weather Forecast

Issued on Monday, 04 December 2023 at 01:21 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1-G2 (Minor-Moderate geomagnetic storms) likely day 1 and 2 (04-05 Dec). Chance of isolated Moderate Class flares (R1-R2 Blackouts) days 1 and 2 (04-05 Dec).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity is at Low levels with the largest flare of the past 24 hours a mid-level Common-class at 03/0806 UTC from the southwest limb, likely from a sunspot region now on the far-side of the visible disc. There are nine sunspot regions. The largest and most magnetically complex area lies in the southwest disc, though it continues to decay and simplify. Two new regions in the southeast have developed into small, moderately complex sunspots. Meanwhile a region in the northeast has seen the emergence of some minor spots of mixed polarity to the south of the existing moderately large lead spot. The remaining regions on the visible disc are mature and stable.

Despite a number of coronal mass ejection (CME) signatures evidenced in solar imagery during the past 24 hours, none are considered Earth-directed. A filament (arc of the sun's material) that erupted from the south-centre disc around 03/2200 UTC appears not to have lifted off energetically, however, further solar imagery is required to confirm that no significant CME has occurred.

Solar Wind / Geomagnetic Activity: Solar wind parameters have been indicative of a near background wind environment that has given way to the onset of the fast winds from a large coronal hole in the western hemisphere. Solar wind speeds were background to slightly elevated for much of the period, varying between 390-450km/s. From 03/1600 UTC speeds have steadily risen to reach elevated levels, around 530km/s by the end of 03 Dec. The Interplanetary Magnetic Field (IMF) was initially moderate before erratically falling to weak levels. The important north-south component of the IMF was largely positive. Resultant Geomagnetic activity was Quiet to Unsettled (Kp 1-3).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) persisted at Background levels with no solar radiation storms occurring.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be Low with a chance for isolated Moderate flares (R1-R2 Blackouts) on days 1-2 (04-05 Dec), reducing to a slight chance on days 3-4 (06-07 Dec). The bulk of the significant flare risk is attributed to the moderately large sunspot region in the southwest.

Solar Winds / Geomagnetic Activity: A CME that left the sun late on 01 Dec has a chance to give a glancing impact at Earth late day 1 (04 Dec) or early day 2 (05 Dec), otherwise no Earth-directed CMEs feature in the forecast period. Solar winds have increased to Elevated levels, this is likely due to the early arrival of the fast wind from a large coronal hole. Speeds should increase further on days 1 and 2 (04-05 Dec) to become Strong, probably peaking between 600-700km/s. Speeds should then slowly ease from day 3 (06 Dec) onwards, likely becoming

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Elevated by the end of day 4 (07 Dec).

Geomagnetic activity is expected to be Quiet to Unsettled early on day 1 (03 Dec), then forecast to increase to G1-G2/Minor-Moderate Storm (Kp5-6) levels late day 1 (04 Dec) and early day 2 (05 Dec). Following peak geomagnetic activity, indices should fall to Unsettled to Active by the end of day 2 (05 Dec), before becoming Quiet to Unsettled from day 3 (06 Dec) onwards.

Aurora: Auroral activity is expected to become enhanced day 1 or 2 (04 or 05 Dec), when the onset of faster solar winds are expected at Earth. From the UK views of aurora may be possible from as far south as Northern England and Northern Ireland on Monday night where skies are clear, with a diminishing risk on subsequent days as geomagnetic activity reduces.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is expected to remain at background levels with no Solar Radiation Storms expected.

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Met Office Space Weather Forecast

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	70	50	5	1
Strong	G3	No	10	5	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	30	30	15	15
Very Active	R3 to R5 X	No	3	3	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	5	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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